Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of	)	
	)	
Mitigation of Orbital Debris	)	IB Docket No. 02-54
	)	

COMMENTS OF TELESAT CANADA

Telesat Canada ("Telesat" or "the Company") is pleased to provide the Federal Communications Commission ("FCC" or "the Commission") with the following comments in the above captioned proceeding. As the operator of a number of satellites, safe operation and end-of-life de-orbiting of satellites is a matter of significant importance to Telesat, both in terms of how the Company manages its own spacecraft and how other satellite operators in close proximity manage theirs.

In what follows, Telesat will first provide relevant background information on its operations and current practices with respect to orbital debris mitigation, and then provide comment on certain matters or proposals raised in the Commission's Notice of Proposed Rule Making ("the NPRM")[1] of specific concern or interest to Telesat. All of these comments are provided from the perspective of an operating company that procures and operates geostationary satellites.

Background

Telesat is a Canadian-licensed satellite facility provider. The Company was established in 1969, and in 1972 launched the world's first domestic communications satellite placed in geostationary orbit. Over the past 30 years, the Company has successfully launched and operated 13 Fixed Satellite Services ("FSS") and Direct Broadcast Satellite ("DBS") satellites of its own.

[1] *Mitigation of Orbital Debris* (Notice of Proposed Rule Making) FCC 02-80, IB Docket No. 02-54, (adopted March 14, 2002) ("*NPRM*").

Telesat's current fleet consists of three FSS satellites, Anik E1, E2 and F1, along with a DBS satellite, Nimiq. The Company has two satellites under construction, Anik F2 (another FSS satellite) and Nimiq 2 (a second DBS satellite), as well as another FSS satellite, Anik F3, in the planning stage. Anik F2 and Nimiq 2 are scheduled to be launched over the next year, to be followed by Anik F3 in 2005. In addition to providing service in Canada, the two Anik E satellites and Anik F1 are on the FCC's C and Ku-band Permitted Space Station List.[2] An application to have Anik F2 placed on that list has also been filed with the Commission, along with a separate application for a declaratory ruling for this satellite to be allowed to provide two-way broadband Ka-band service within the United States.[3]

Over the past year, Telesat continued in its role as one of the most reliable satellite system operators in the world, achieving an unprecedented end-to-end service reliability level of 99.98 percent across all of its networks. In addition to flying its own satellites, Telesat currently controls four satellites for other operators. The Company has also been involved in the procurement of some 70 satellites for other operators in more than 30 countries.

None of Telesat's own satellites, nor any of the satellites owned by others that Telesat has provided consultant services to in the procurement process, have experienced a launch failure. Moreover, none of Telesat's satellites have ever experienced an in-orbit failure such that the satellite became orbital debris and therefore a hazard to satellites operated by other satellite facility providers.

Telesat believes that orbital debris mitigation is an integral part of its responsibility as a satellite operator benefiting from access to the space resource. To this end, the Company's existing satellites have been designed to produce no in-orbit debris. Rather, the Company's operations

---

[2] *Telesat Canada Request to Eliminate Conditions on ANIK E1 and E2's Inclusion on the Permitted Space Station List*, DA 01-2051, 16 FCC Rcd 15979 (International Bureau, 2001) (Order); and *Telesat Canada (Petition for Declaratory Ruling of ANIK F1 on the Permitted Space Station List)*, DA 00-2835, 15 FCC Rcd 24828, (International Bureau, 2000) (Order).

[3] *Telesat Canada - Petition for Declaratory Ruling For Inclusion of Anik F2 on the Permitted Space Station List*, File No. SAT-PDR-20010906-00082 (filed September 6, 2001); and *Telesat Canada – Petition for Declaratory Ruling to Serve the U.S. Market Using Ka-Band Capacity on Anik F2*, File No. SAT-PDR-20020321-00027 (filed March 21, 2002).

planning includes provision for de-orbiting its satellites at the end of their useful lives. Specifically, the satellite orbit perigee will be raised by a minimum of 100 to 150 kilometers, with all RF radiation sources turned off. The Company's satellite procurement contracts also generally require a specific allocation of fuel for this purpose.

Furthermore, it is Telesat's practice in procuring satellites to require that single point failures within the satellite be minimized, if not eliminated, and that the adverse impact of such failures be minimized to the maximum extent possible. The space environment within which the satellite must operate is reasonably well understood. In line with industry practice, Telesat requires that its satellites be designed to survive in such an environment, with some margin.

Additionally, in order to minimize the possibility of collision of a Telesat-controlled satellite with any other object that may enter into the geostationary orbit region, the Company has entered into an agreement with MIT/Lincoln Laboratories ("MIT/LL"). Under this agreement, MIT/LL provides early warning of the intrusion of an uncontrolled object within the operating box of a satellite. With this information, Telesat is able to avoid the uncontrolled object. This agreement applies to all Telesat-controlled satellites.

In the case of future generation Telesat satellites, the Company plans to follow similar orbital debris mitigation design and operational strategies and practices as described above. These strategies and practices are in line with those of the industry and largely consistent with the proposals set out in the NPRM. However, as discussed below, it is Telesat's view that the Commission should not attempt to extend its rules concerning these matters to foreign-licensed satellite systems, either directly or though U.S. earth station licensing procedures. Rather, the international dimensions of these matters are most appropriately handled on a multilateral basis in international forums or on a government-to-government basis.

Comment on the NPRM Proposals

1. Control of Debris & Selection of a Safe Operational Configuration

At paragraphs 36 and 37 of the NPRM, the Commission notes that U.S. Government standard practices include provisions that speak directly to the hardware design of spacecraft. Specifically, these practices provide that programs will assess and limit the amount of debris released in a planned manner during normal operations, and that a safe operational configuration will be selected (i.e., the program will assess and limit the probability that an operating spacecraft will become a source of debris through collisions with man-made objects or meteors).

With regard to the first of these provisions, the Commission notes that the communications payloads it has licensed have not typically involved the planned release of any operational debris following the launch phase, but believes that it is appropriate for applicants to confirm in any orbital debris mitigation showing that this is the case. It has also been Telesat's experience that very little, if any, debris is produced during a geostationary satellite mission following the launch phase.

With regard to the second of these provisions (i.e., the selection of a safe operational configuration), as noted above it is Telesat's practice in procuring satellites to require that single point failures within the satellite be minimized, and that the adverse impact of such failures be minimized to the maximum extent possible. As also noted above, Telesat has included a requirement in its satellite procurement contract for an allocation of fuel to be used to de-orbit the satellite at its end of life, and has entered into an agreement with MIT/LL for detection of uncontrolled objects in the satellite box of operation so as to allow operators time to perform evasive maneuvers as required to avoid collisions. Many other satellite operators have also contracted for the MIT/LL service.

Notwithstanding the above, Telesat agrees that requiring licensees to confirm and outline their orbital debris mitigation practices and plans to the Commission as a requirement for access to a U.S. orbital position would not be an onerous requirement.

2. Minimizing Debris Generated by Accidental Explosions

As indicated at paragraph 39 of the NPRM, U.S. Government standard practices provide that programs are to assess the probability of accidental explosion during and after completion of mission operations, and that all sources of stored energy on-board a satellite should be "depleted or safed" when they are no longer needed for mission operations or post-mission disposal. The Commission further notes at paragraph 40 that the operator's economic interest in ensuring reliability will provide "ample incentive" for designing a satellite that does not experience accidental explosions during its useful life, but goes on to suggest that similar incentives may not apply with respect to procedures at or near the end of a satellite's life (i.e., the operator may have an economic incentive to continue income-producing activities even as a satellite's systems degrade).

With the cost of a satellite running into the hundreds of millions of dollars, Telesat agrees with the Commission that operators have strong economic incentives to ensure that their satellites are designed so as to minimize any possibility of accidental explosion. Similarly, while it is true that an operator has an incentive to continue the income-producing activities of an aging satellite as long as possible so as to maximize the return on the initial investment, typically that operator will be replacing the aging satellite with another in the same orbital location. Indeed, to ensure continuity of service, the new satellite must be in place before the old satellite reaches its end of life. Moreover, so as not to jeopardize the operation of the new satellite in that orbital location, the operator must have the means available to safely dispose of the aging satellite. As a satellite approaches its end of life, the operator will therefore typically have an incentive to ensure that sufficient fuel remains available to de-orbit or to otherwise dispose of the satellite in a safe manner. Indeed, all other things being equal, this incentive to protect the long-run income-generating activities of a replacement satellite will likely be much stronger than any incentive to continue income-generating activities of the aging satellite past the safe disposal point.

In this regard, Telesat would further note that operators often replace aging satellites which still have several months, if not years, of useful life. These satellites are then typically kept as in-orbit spares or disposed of through sale or lease to another operator to be used in another orbital

location until that operator can launch its own replacement satellite. The new operator would also have the same incentive to retain the means of safely disposing of this aging satellite as would the previous owner.

Telesat therefore believes that satellite operators will generally have strong financial incentives to design their spacecraft to minimize the possibility of accidental explosions and to dispose of their satellites at end of life in a safe manner. As noted above, Telesat has also made it a practice in its satellite procurement contracts to require a specific allocation of fuel for de-orbiting purposes. That said, requiring operators wishing to access U.S. orbital slots to expressly confirm that they have addressed these issues in orbital debris mitigation filings as proposed by the Commission should not be an onerous requirement.

3. Safe Flight Profiles

The colocation of satellites operating at different frequencies, presumably operated by different agencies or companies is a difficult and complex subject. In order to minimize the possibility of collision and to reduce coordination to a workable minimum, it is common for the agencies in question to mutually agree to offset the satellites in question by at least 0.1 degrees in longitude. In order to conduct proper colocation operations with closer spacing than 0.1 degrees, it is necessary to go to extraordinary technical length to determine the location of each satellite and to control them appropriately.

As indicated at paragraph 47 of the NPRM, the Commission's own stationkeeping rules for FSS satellites are more stringent than the requirement in the ITU *Radio Regulations*. These rules require that satellites be designed with the capability of being maintained in orbit within 0.05 degrees of their assigned orbital longitude, and must be maintained in orbit at their assigned orbital longitude within the tolerance specified by the Commission. The Commission asks whether the longitudinal tolerance applicable to the FSS should be applied to space stations in other services, such as mobile satellite service or remote sensing satellites.

In response, Telesat would note that, while from a purely mission or operations point of view mobile or remote sensing satellites may not require such precise stationkeeping requirements, precise stationkeeping is important from a colocation or adjacent operations point of view. For geostationary satellite operators, it is important to know that neighboring satellites have control requirements and that they will not encroach into an adjoining stationkeeping box. This is a collision avoidance precaution. It may not be necessary to control all geosynchronous satellites to the same precise requirements, but in Telesat's view it is important that all have published control limits which are maintained.

At paragraph 51, the Commission asks whether operators coordinate maneuvers with each other and what, if any, notification requirements should be adopted concerning maneuvers by FCC-licensed satellite systems. It is Telesat's practice to routinely transmit current orbital elements for each of the satellites that it operates to the United States Space Command. Also, whenever Telesat relocates a satellite or disposes of one, it is the Company's practice to inform all in-band operators with satellites over the orbital arc in question of Telesat's plans, and to provide basic frequency plans and power levels, points of contact for further coordination and a summary of the "relocation plan". It is also the Company's practice not to transmit to the moving satellite whenever the angular separation between the moving and a fixed satellite, as seen from a Telesat transmitter, is less than a specified threshold that depends upon the frequency and antenna size, but is generally between 0.5 degrees and 1.9 degrees. Further, it is the Company's practice to adopt a "disposal like" strategy when relocating satellites. That is, a "transfer orbit" is used that places the satellite either at least 100 kilometers above or below geosynchronous orbit, and does not intersect that orbit. It is also Telesat's experience that such practices are normal for any agency moving a geostationary satellite, either during the pre-operational phase or a "mid-life" relocation, or for final disposal.

Telesat believes that any operator or satellite manufacturer who plans such a move should inform all other agencies with whom they might interfere, either from an RF perspective or a physical one. Of course, all possible efforts should be made to avoid the physical interference. To simply post such information on a web site is insufficient for this purpose. Rather, the onus should be on the operator to inform all other potentially impacted parties of its plans. To ensure that all

relevant parties are properly informed, some sort of centralized database, managed by some international agency or group (e.g., the ITU), may be useful.

At indicated at paragraph 52 and subsequent paragraphs of the NPRM, U.S. Government guidelines also provide for post-mission disposal of space structures which include "considerations of cost-effectiveness". In this regard, reference is made to a number of possible "storage orbits", including one at approximately 300 kilometers above geosynchronous altitude.

As stated above, Telesat's satellite disposal practice has been to target orbits with perigees of 100 to 150 kilometers above geosynchronous altitude, and no subsequent problems or concerns have arisen from this practice. As also stated above, Telesat budgets a specific amount of fuel for this purpose, representing about one month of stationkeeping operation. There is therefore a definite cost associated with this operation. Indeed, a 300 kilometer requirement would require two to three times as much fuel as the Company currently budgets for, with a corresponding reduction in revenue-generation potential for the satellite of more than two months. Based on its experiences using the lower disposal orbit, the Company does not believe that a doubling or tripling of that orbit would be cost effective. In the Company's view, if the Commission were to incorporate disposal orbits into its rules, establishing a minimum of 100 kilometers above the geostationary attitude range would be adequate for this purpose.

4. Scope of the Proposals

With respect to the scope and nature of the Commission's authority concerning orbital debris mitigation for non-U.S.-licensed space stations as discussed at paragraphs 62 and 63 of the NPRM, Telesat believes that it is inappropriate for the Commission to attach space station orbital debris conditions to the licenses of earth stations in the U.S. that seek to operate with non-U.S.-licensed space stations. In Telesat's view, such an action would set a precedent that would lead to difficulties for satellite operators. Given the liberalization in satellite communications arising from the WTO-GATS Agreement concerning basic telecommunications services, most communication satellites are now designed to provide service over broad coverage areas, encompassing a number of administrations. If different, and potentially conflicting, orbital

debris mitigation measures were to be imposed by each administration where landing rights are sought, satellite operators would face not only an increased administrative burden, but potentially artificial barriers to entry that could be misapplied by some administrations as a non-tariff barrier. The result would be to the ultimate detriment of satellite users.

Telesat believes that the most appropriate method of ensuring worldwide progress in addressing the important issue of orbital mitigation would be through a multilateral forum such as the United Nations Committee on Peaceful Uses of Outer Space ("UNCOPUOS") or the ITU. In the absence of, or in advance of, multilateral progress on this issue, Telesat suggests that bilateral arrangements be concluded between administrations with significant space interests. Under such bilateral arrangements, each administration would recognize the orbital debris mitigation measures required as license conditions by the other. Neither administration would impose orbital debris mitigation constraints as part of the licensing requirements for earth stations operating with satellites licensed by the other administration.

Conclusion

As a satellite operator, Telesat has always taken steps to ensure that its satellites operate safely and can be de-orbited at end-of-life without risk to other satellite systems. Indeed, Telesat's experience has been that the whole satellite operator community takes this issue very seriously and works cooperatively with other operators. Notwithstanding this close cooperation, Telesat believes administrations should consider, as the FCC is doing in this proceeding, requiring satellite operators they license to confirm that they have adequate orbital debris mitigation practices and plans in place, with consideration of these same issues with operators licensed in other jurisdictions being addressed in the appropriate multilateral forums (e.g., UNCOPUOS or the ITU) or through government-to-government negotiations.

Telesat appreciates having the opportunity to provide these comments to the Commission.

Respectfully submitted,

Telesat Canada

Paul D. Bush
Vice President – Corporate Development

July 17, 2002